	Type	L #	Hits	Search Text	DBs
1	IS&R	L2	1550	((606/9-13) or (607/88-91)).CCLS.	USPAT
2	BRS	L3	1	1 and 2	USPAT
3	BRS	L1	11	(Sharon near2 Uzi).in.	USPAT; US-PGPUB; EPO; JPO; DERWENT
4	BRS	L4	11	(Sharon near2 Uzi).in.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB
5	BRS	L5	6384	hair WITH (remove or removal)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB
6	BRS	L6	0	4 and 5	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB
7	BRS	L7	109	2 and 5	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB
8	BRS	L10	18	9 and (control or controller)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB

	Type	L #	Hits	Search Text	DBs
9	BRS	L11	15	10 and (focus or lens)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB
10	BRS	L12	9	("4492230" | "4887019" | "5125923" | "5219347" | "5360447" | "5364390" | "5411502" | "5480396" | "5533997").PN.	USPAT
11	BRS	L13	19	("4733660" | "4750486" | "4941082" | "4945914" | "4973848" | "5178617" | "5336217" | "5344434" | "5474528" | "5474549" | "5501680" | "5531740" | "5544651" | "5546214" | "5558666" | "5588428" | "5595568" | "5599342" | "5618285").PN.	USPAT

	Type	L #	Hits	Search Text	DBs
12	BRS	L9	21	8 and (image or imager)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB
13	BRS	L8	107	7 and laser	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB
14	BRS	L15	2718	Sharon.in.	USPAT; US-PGPUB; EPO; JPO; DERWENT
15	BRS	L16	0	1 and 5	USPAT; US-PGPUB; EPO; JPO; DERWENT
16	BRS	L17	3	15 and 5	USPAT; US-PGPUB; EPO; JPO; DERWENT
17	BRS	L18	0	200071045.URPN.	USPAT
18	BRS	L19	0	200071045.URPN.	USPAT
19	BRS	L20	5	2 and 15	USPAT; US-PGPUB; EPO; JPO; DERWENT
20	IS&R	L21	269	(606/9).CCLS.	USPAT

	Type	L #	Hits	Search Text	DBs
21	IS&R	L22	2	(("5531740") or ("5628744")).PN.	USPAT

	1	Document ID	Title	Current OR
1	☒	US 6383177 B1	Apparatus for tissue treatment	606/9
2	☒	US 6383176 B1	Hair removal device and method	606/9
3	☒	US 6328733 B1	Hand-held laser scanner	606/13
4	☒	US 6273883 B1	Alexandrite laser system for treatment of dermatological specimens	606/9
5	☒	US 6235015 B1	Method and apparatus for selective hair depilation using a scanned beam of light at 600 to 1000 nm	606/9
6	☒	US 6162211 A	Skin enhancement using laser light	606/9
7	☒	US 6104959 A	Method and apparatus for treating subcutaneous histological features	607/101
8	☒	US 6074382 A	Apparatus for tissue treatment	606/9
9	☒	US 5957915 A	Hand-held laser scanner	606/13
10	☒	US 5938657 A	Apparatus for delivering energy within continuous outline	606/9

	Inventor
1	Balle-Petersen, Olav et al.
2	Connors, Kevin P. et al.
3	Trost, David
4	Furumoto, Horace W.
5	Mead, III, Douglass S. et al.
6	Tankovich, Nikolai I. et al.
7	Spertell, Robert Bruce
8	Asah, Bjarne et al.
9	Trost, David
10	Assa, Shlomo et al.

	1	Document ID	Title	Current OR
11	☒	US 5743902 A	Hand-held laser scanner	606/18
12	☒	US 5595568 A	Permanent hair removal using optical pulses	606/9
13	☒	US 6306128 B1	Cooling apparatus for cutaneous treatment employing a laser and method for operating same	606/9
14	☒	US 6273885 B1	Handheld photoepilation device and method	606/9
15	☒	US 6248103 B1	Apparatus and method for dynamic cooling of biological tissues for thermal mediated surgery using long laser pulses	606/9
16	☒	US 6080147 A	Method of employing a flashlamp for removal of hair, veins and capillaries	606/9
17	☒	US 5879346 A	Hair removal by selective photothermolysis with an alexandrite laser	606/9
18	☒	US 5868732 A	Cooling apparatus for cutaneous treatment employing a laser and method for operating same	606/9
19	☒	US 5683380 A	Method and apparatus for depilation using pulsed electromagnetic radiation	606/9

	Inventor
11	Trost, David
12	Anderson, R. Rox et al.
13	Waldman, Amir et al.
14	Koop, Dale E. et al.
15	Tannenbaum, Sam et al.
16	Tobinick, Edward L.
17	Waldman, Amir et al.
18	Waldman, Amir et al.
19	Eckhouse, Shimon et al.

	1	Document ID	Title	Current OR
20	☒	US 5628744 A	Treatment beam handpiece	606/12
21	☒	WO 200071045 A	Laser system for skin treatment, has controller to regulate laser to irradiate pulsed laser light towards spot located on skin through optical system	
22	☒	US 6032071 A	Skin examination device	600/476
23	☒	US 5860967 A	Dermatological laser treatment system with electronic visualization of the area being treated	606/9
24	☒	US 5820625 A	Light depilating apparatus	606/9
25	☒	US 5738679 A	Apparatus for laser treatment for living tissue	606/11
26	☒	US 5735844 A	Hair removal using optical pulses	606/9
27	☒	US 4617926 A	Depilation device and method	606/9

	Inventor
20	Coleman, Tony D. et al.
21	SHARON, U
22	Binder, Michael
23	Zavislan, James M. et al.
24	Izawa, Yoshihiro et al.
25	Daikuzono, Norio
26	Anderson, R. Rox et al.
27	Sutton, A. Gunilla

	1	Document ID	Title	Current OR
1	☒	US 6383177 B1	Apparatus for tissue treatment	606/9
2	☒	US 6383176 B1	Hair removal device and method	606/9
3	☒	US 6328733 B1	Hand-held laser scanner	606/13
4	☒	US 6273883 B1	Alexandrite laser system for treatment of dermatological specimens	606/9
5	☐	US 6261310 B1	Laser safe treatment system	607/89
6	☒	US 6235015 B1	Method and apparatus for selective hair depilation using a scanned beam of light at 600 to 1000 nm	606/9
7	☐	US 6165170 A	Laser dermablator and dermablation	606/9
8	☒	US 6162211 A	Skin enhancement using laser light	606/9
9	☒	US 6104959 A	Method and apparatus for treating subcutaneous histological features	607/101
10	☒	US 6074382 A	Apparatus for tissue treatment	606/9

	Inventor
1	Balle-Petersen, Olav et al.
2	Connors, Kevin P. et al.
3	Trost, David
4	Furumoto, Horace W.
5	Neuberger, Wolfgang et al.
6	Mead, III, Douglass S. et al.
7	Wynne, James Jeffrey et al.
8	Tankovich, Nikolai I. et al.
9	Spertell, Robert Bruce
10	Asah, Bjarne et al.

	1	Document ID	Title	Current OR
11	☒	US 5957915 A	Hand-held laser scanner	606/13
12	☒	US 5938657 A	Apparatus for delivering energy within continuous outline	606/9
13	☐	US 5824023 A	Radiation-delivery device	607/88
14	☒	US 5743902 A	Hand-held laser scanner	606/18
15	☐	US 5519534 A	Irradiance attachment for an optical fiber to provide a uniform level of illumination across a plane	359/599

	Inventor
11	Trost, David
12	Assa, Shlomo et al.
13	Anderson, Richard Rox
14	Trost, David
15	Smith, Paul D. et al.

US005993440A

United States Patent [19]

Ghassemi

[11] **Patent Number: 5,993,440**

[45] **Date of Patent: Nov. 30, 1999**

[54] **NON-INVASIVE LASER CUTTING DEVICE AND METHOD**

[76] Inventor: **Faramarz Frank Ghassemi**, 6553 Timber Ct., San Jose, Calif. 95120

[21] Appl. No.: **09/027,145**

[22] Filed: **Feb. 20, 1998**

Related U.S. Application Data

[60] Provisional application No. 60/062,062, Oct. 16, 1997.

[51] **Int. Cl.**[6] **A61N 5/00**; A61B 17/36; B26B 19/44

[52] **U.S. Cl.** **606/9**; 30/41.5

[58] **Field of Search** 606/9, 13, 16, 606/17, 27, 28, 32, 36, 37, 45, 48, 51; 30/41.5, 41.6

[56] **References Cited**

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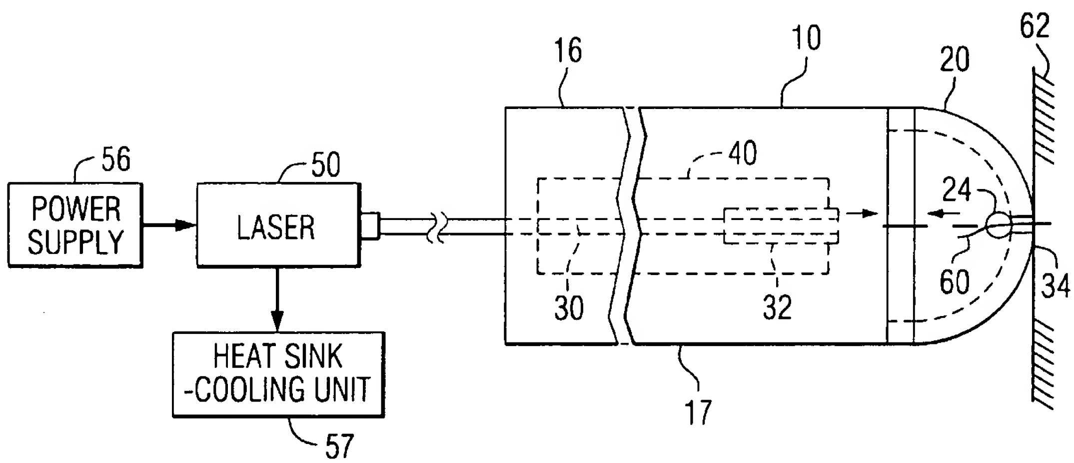
Primary Examiner—Linda C. M. Dvorak
Assistant Examiner—Sonya C Harris-Ogugua
Attorney, Agent, or Firm—Charles E. Wands

[57] **ABSTRACT**

A hand-held, non-invasive cutting device is configured to cut a fiber-like element, such as animal or human hair projecting from the surface of a medium, such as body skin, without exposing the user to the cutting beam. The device exterior is shaped to be readily placed against the surface of the body and has an aperture that accommodates passage of the hair to be cut into an interior region of the housing. The housing includes an optical energy beam director that directs a beam of optical energy, such as a laser beam generated by an external or internal laser, through an interior cutting zone, and onto the inserted element, thereby severing or vaporizing the element. Because the laser beam is aligned with and parallel to the longitudinal direction of the cutting window, then regardless of where it is inserted in the cutting window, the element will be cut by the laser beam. In addition, the beam cannot exit the cutting window, so that the invention is non-invasive and safe for consumer use.

16 Claims, 3 Drawing Sheets



350-96.1 SR

10/21/86 XR 4,617,926

United States Patent [19]

Sutton

[11] Patent Number: 4,617,926

[45] Date of Patent: Oct. 21, 1986

[54] DEPILATION DEVICE AND METHOD

[76] Inventor: A. Gunilla Sutton, 19, Treguntter Road, London SW10, United Kingdom

[21] Appl. No.: 574,922

[22] Filed: Jan. 30, 1984

[51] Int. Cl.⁴ A61N 5/00

[52] U.S. Cl. 128/303.1; 128/355; 128/398; 350/96.1; 350/96.18

[58] Field of Search .... 128/303.1, 395–398, 128/355; 219/121 LA; 350/96.1, 96.18, 96.29, 96.30, 96.32

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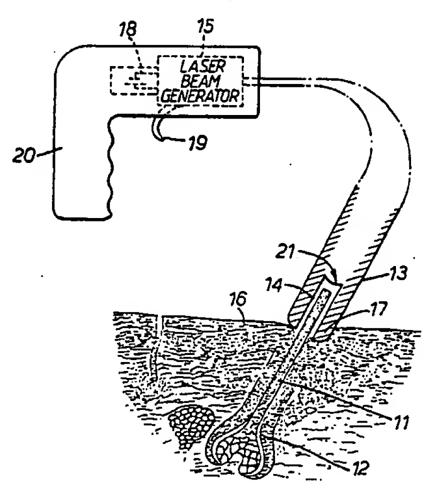
Primary Examiner—Lee S. Cohen

Attorney, Agent, or Firm—Ralph R. Rath

[57] ABSTRACT

A depilation device includes a laser beam generator **15** embodied in a hand gun **20** with a trigger **19** enabling pulses of laser energy to be delivered along a flexible fibre optic probe **13** which has a bore in the end which can fit over a hair to be destroyed. At the end of the bore, the optic is formed as a convex lens so that the pulses of energy are focused into the hair so that the hair and follicle can be destroyed without destroying surrounding tissue.

12 Claims, 2 Drawing Figures



US006015404A

United States Patent [19]

Altshuler et al.

[11] **Patent Number: 6,015,404**

[45] **Date of Patent: *Jan. 18, 2000**

[54] **LASER DERMATOLOGY WITH FEEDBACK CONTROL**

[75] Inventors: **Gregory Altshuler**, Beverly, Mass.; **Andrei V. Erofeev**, St. Petersburg, Russian Federation

[73] Assignee: **Palomar Medical Technologies, Inc.**, Burlington, Mass.

[*] Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

[21] Appl. No.: **08/759,036**

[22] Filed: **Dec. 2, 1996**

[51] **Int. Cl.**[7] **A61N 5/06**

[52] **U.S. Cl.** **606/9**; 606/10

[58] **Field of Search** 606/2, 3, 4, 5, 606/6, 10, 11, 12, 14, 15, 16, 17, 19

[56] **References Cited**

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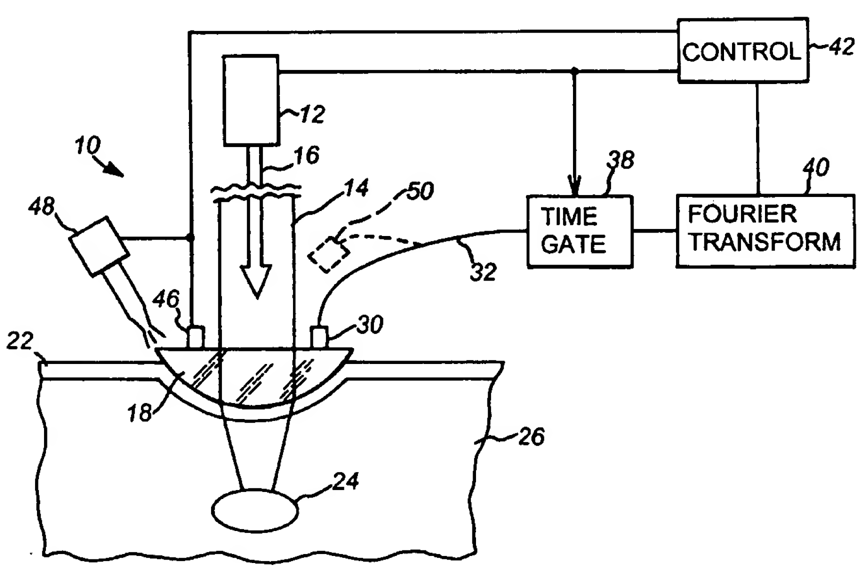
Primary Examiner—Robert L. Nasser
Attorney, Agent, or Firm—Wolf, Greenfield & Sacks, P.C.

[57] **ABSTRACT**

Method and apparatus are provided for use with systems applying laser energy to treat a selected dermatology problem. The method and apparatus protect skin not under treatment in skin regions affected by the laser by detecting, with a suitable sensor, at least a selected parameter in the skin region affected by the delivered laser energy and performing a control function to effect the desired protection by use of a feedback mechanism which is operative in response to an output from the sensor. For some embodiments, two laser pulses may be utilized, which pulses are spaced by a time which is preferably greater than the thermal relaxation time for affected regions not under treatment, for example an epidermis through which the energy is passed to an area under treatment, but is less than the thermal relaxation time of the area under treatment. The first of the pulses serves as a prediagnosis pulse which is clearly below the damage threshold for protected areas, with the sensor output for the first pulse being utilized to control at least one parameter of the second pulse.

9 Claims, 4 Drawing Sheets



US006080147A

United States Patent [19]

Tobinick

[11] **Patent Number: 6,080,147**

[45] **Date of Patent: Jun. 27, 2000**

[54] **METHOD OF EMPLOYING A FLASHLAMP FOR REMOVAL OF HAIR, VEINS AND CAPILLARIES**

[76] Inventor: **Edward L. Tobinick**, 100 UCLA Medical Plaza Suite 205, Los Angeles, Calif. 90024-6903

[21] Appl. No.: **09/095,630**

[22] Filed: **Jun. 10, 1998**

[51] **Int. Cl.**^{7} **A61B 17/52**

[52] **U.S. Cl.** **606/9**; 606/2; 606/10; 606/13

[58] **Field of Search** 606/9, 2, 3, 10–14; 607/89, 100

[56] **References Cited**

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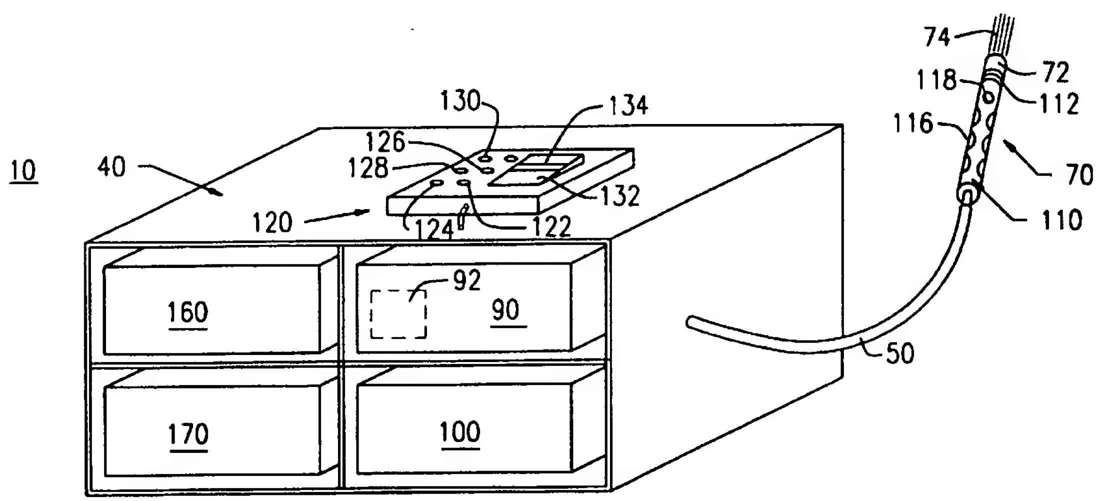
Primary Examiner—Linda C. M. Dvorak
Assistant Examiner—Roy Gibson
Attorney, Agent, or Firm—Ezra Sutton

[57] **ABSTRACT**

A method of removing hair or blood vessels from the skin of a patient using a flashlamp, a sequence control device and an optical delivery system, and includes the steps of controlling the flashlamp to sequentially emit a series of pulses of incoherent light energy, transmitting the series of pulses of incoherent light energy through the optical delivery system to the same spot on the skin containing the hair or blood vessels with the sequential pulses of incoherent light energy transmitted through the optical delivery system from the flashlamp, and pulsing the flashlamp at least two times at a wavelength in the range 550 to 1200 nm, at a power level in the range of 4 to 25 Joules/cm^2, each pulse having a duration in the range of ½ to 10 milliseconds, a delay between pulses in the range of 1 to 10 milliseconds, and having a beam diameter on the treatment area in the range of 4 to 50 millimeters.

8 Claims, 5 Drawing Sheets



US005464436A

United States Patent [19]

Smith

[11] **Patent Number: 5,464,436**

[45] **Date of Patent: Nov. 7, 1995**

[54] **METHOD OF PERFORMING LASER THERAPY**

[75] Inventor: **Chadwick F. Smith**, Rolling Hills, Calif.

[73] Assignee: **LaserMedics, Inc.**, Stafford, Tex.

[21] Appl. No.: **233,426**

[22] Filed: **Apr. 28, 1994**

[51] **Int. Cl.**[6] **A61N 5/00**

[52] **U.S. Cl.** **607/89**; 606/3; 606/9; 606/13

[58] **Field of Search** 607/88–90; 606/3, 606/9, 13

[56] **References Cited**

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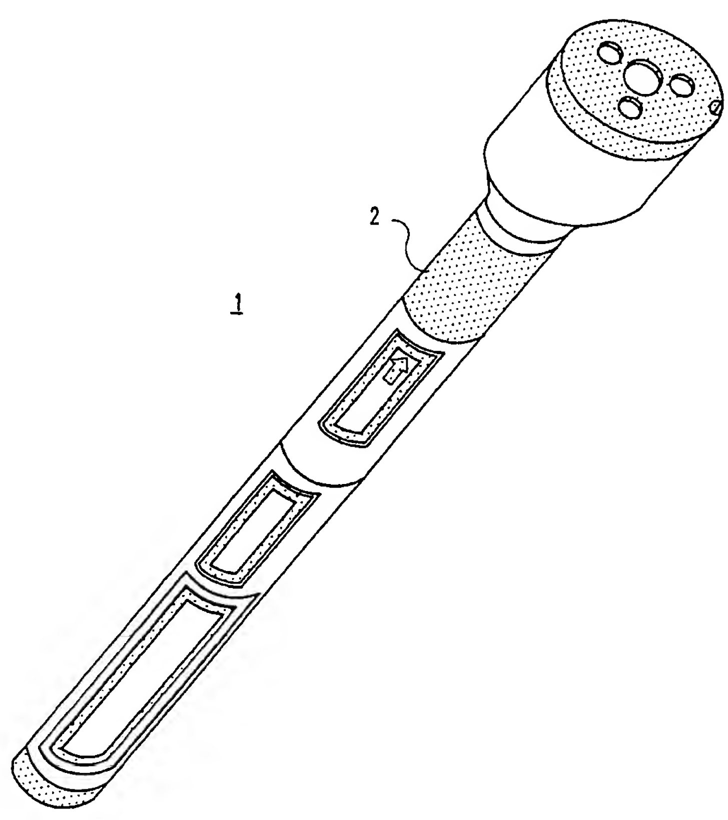
Primary Examiner—Angela D. Sykes
Attorney, Agent, or Firm—Whitham, Curtis, Whitham & McGinn

[57] **ABSTRACT**

A method of treating a patient, includes providing a laser source for emitting a laser light, diagnosing an afflicted area of the patient, delivering the laser light to the afflicted area for at least one treatment cycle, the laser source being operable on the afflicted area at a level of 1 Joule/cm^2 per treatment cycle, monitoring the afflicted area after the treatment cycle has been completed, and repeating the steps of diagnosing and delivering the laser light to the afflicted area based on the monitoring step. Each treatment cycle preferably has a duration of 33 seconds and the wavelength of the laser light is preferably between a range of 800–870 nm, and more preferably is substantially 830 nm.

20 Claims, 5 Drawing Sheets



US006032071A

United States Patent [19]

Binder

[11] **Patent Number: 6,032,071**

[45] **Date of Patent: Feb. 29, 2000**

[54] **SKIN EXAMINATION DEVICE**

[75] Inventor: **Michael Binder**, Vienna, Austria

[73] Assignee: **Norbert Artner**, Vienna, Austria

[21] Appl. No.: **08/849,439**

[22] PCT Filed: **Nov. 28, 1995**

[86] PCT No.: **PCT/AT95/00231**

§ 371 Date: **May 30, 1997**

§ 102(e) Date: **May 30, 1997**

[87] PCT Pub. No.: **WO96/16698**

PCT Pub. Date: **Jun. 6, 1996**

[30] **Foreign Application Priority Data**

Dec. 1, 1994 [AT] Austria 2233/94

[51] **Int. Cl.**⁷ **A61B 5/00**

[52] **U.S. Cl.** **600/476**; 356/369; 606/9

[58] **Field of Search** 600/473, 476, 600/407, 408; 606/9, 10; 356/369; 382/128; 128/922, 925

[56] **References Cited**

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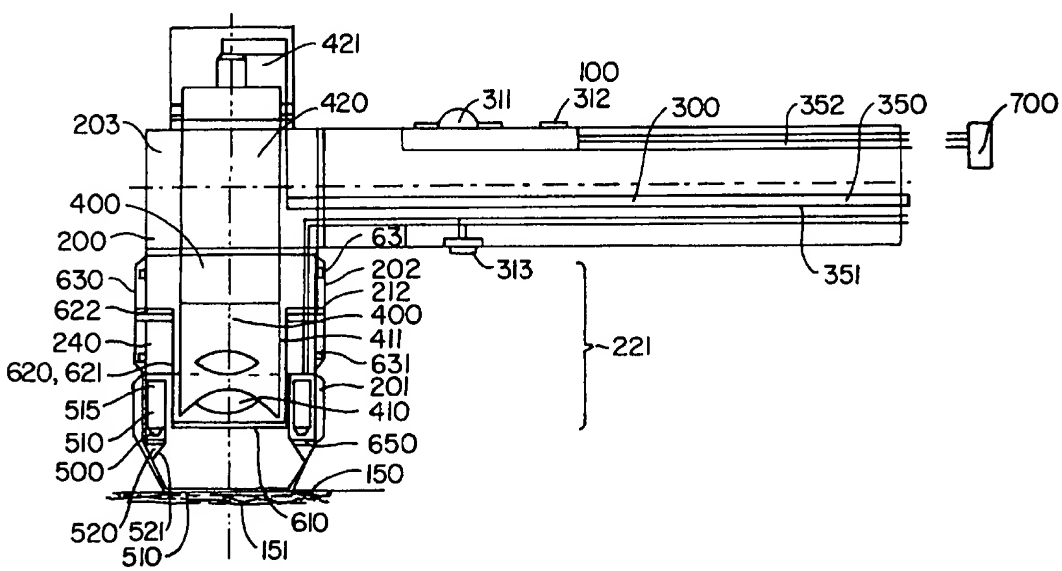
94 17 828 U	12/1994	Germany .

Primary Examiner—Marvin M. Lateef
Assistant Examiner—Shawna J Shaw
Attorney, Agent, or Firm—Townsend and Townsend and Crew LLP

[57] **ABSTRACT**

A device for optical examination of human skin and its pigmentation comprises a cylindrical housing in which are arranged an optical observation device and a vertical illumination device. Where it faces the skin the housing is delimited by a plate made of transparent plastics or glass, which is applied to a skin site to be examined without introducing an immersion fluid. Light polarization devices are situated between the illumination device and the transparent plate and between the transparent plate and the optical observation device, their degree of polarization being controlled or, optionally, their location being movable mechanically into or out of particular light beam paths.

32 Claims, 10 Drawing Sheets



US006059820A

United States Patent [19]

Baronov

[11] **Patent Number:** **6,059,820**

[45] **Date of Patent:** **May 9, 2000**

[54] **TISSUE COOLING ROD FOR LASER SURGERY**

[75] Inventor: **Eugene Baronov**, San Diego, Calif.

[73] Assignee: **Paradigm Medical Corporation**, Newport Beach, Calif.

[21] Appl. No.: **09/174,065**

[22] Filed: **Oct. 16, 1998**

[51] **Int. Cl.**[7] A61N 21/00

[52] **U.S. Cl.** 607/89; 606/9; 606/20

[58] **Field of Search** 606/9, 10, 11, 606/12, 13, 14, 15, 16, 17, 20; 607/88, 89, 90

[56] **References Cited**

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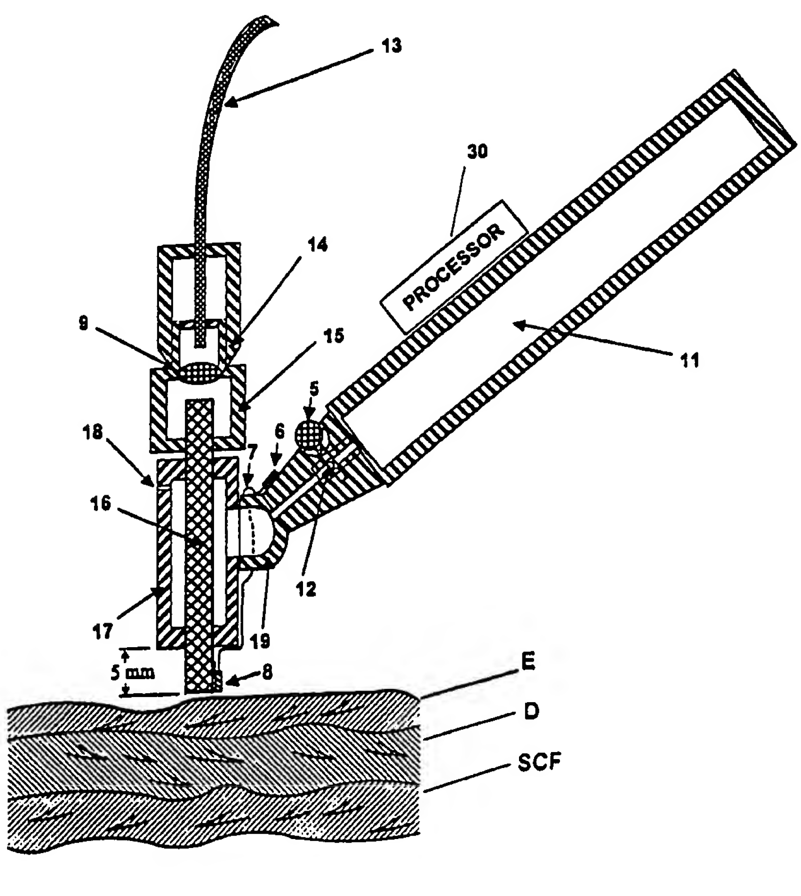
5,902,299	3/1999	Jayaraman	606/20

Primary Examiner—Linda C. M. Dvorak
Assistant Examiner—Soyu Han-Ogugua
Attorney, Agent, or Firm—John R. Ross; John R. Ross, III

[57] **ABSTRACT**

A laser treatment device and process with controlled cooling. The device contains a rod with high heat conduction properties, which is transparent to the laser beam. A surface of the rod is held in contact with the tissue being treated and other surfaces of the rod are cooled by the evaporation of a cryogenic fluid. The cooling is coordinated with the application of the laser beam so as to control the temperatures of all affected layers of tissues. In a preferred embodiment useful for removal of wrinkles and spider veins, the rod is a sapphire rod. A cryogenic spray cools the walls. A first surface is in contact with the skin surface being treated and an opposite surface is contained in an anticondensation oil chamber that is optically connected to a laser beam delivering fiber optic cable. In this preferred embodiment the temperature of the rod is monitored with a thermocouple which provides a feedback signal to a processor which controls the cooling and the laser power to provide proper regulation of temperatures at all affected tissue layers.

13 Claims, 7 Drawing Sheets



United States Patent [19]
Sharon

[11] **3,913,582**
[45] **Oct. 21, 1975**

[54] **LASER DEVICE WITH ARTICULATED ARM**

[75] Inventor: **Uzi Sharon,** Tel-Aviv, Israel

[73] Assignee: **Laser Industries Ltd.,** Ramat-Aviv, Israel

[22] Filed: **Oct. 17, 1973**

[21] Appl. No.: **407,047**

[30] **Foreign Application Priority Data**

Oct. 17, 1972 Israel 40603

[52] **U.S. Cl.** **128/303.1**
[51] **Int. Cl.²** **A61B 17/36**
[58] **Field of Search** .... 128/303 R, 303.1, 395; 331/94.5

[56] **References Cited**

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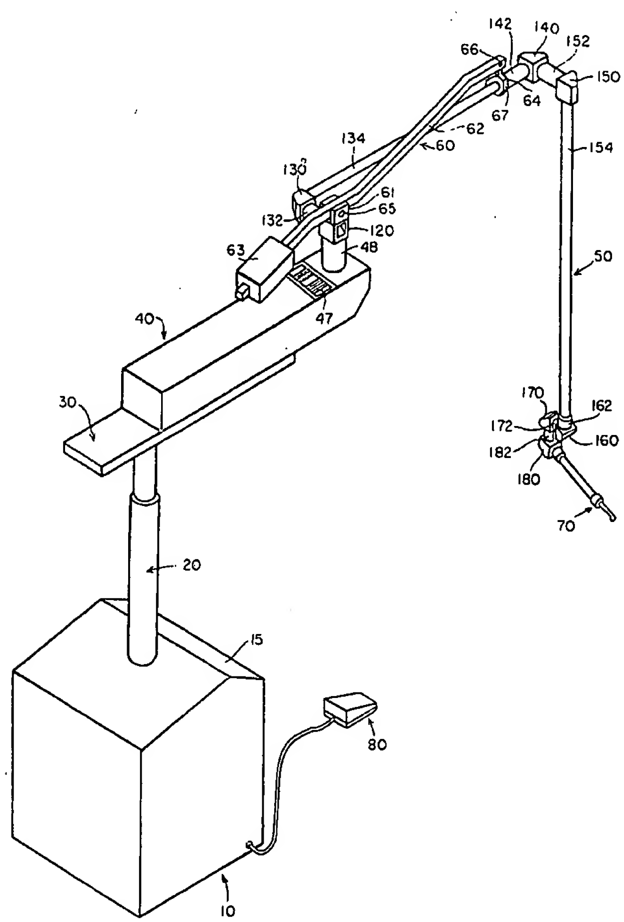
3,720,213	3/1973	Hobart et al.	128/395

Primary Examiner—Lawrence W. Trapp
Attorney, Agent, or Firm—Pennie & Edmonds

[57] **ABSTRACT**

Apparatus for conducting a laser beam from a laser, through an articulated arm, to an output device, said apparatus being constructed so that the output device is easily maneuvered. In one embodiment, a beam from a laser mounted on an optical bench is directed to a first mirror that reflects the beam upward along the axis of a vertical shaft. At the top of the shaft, a second mirror, mounted on a conical bearing and rotatable about the axis of the vertical shaft, reflects the laser beam along the axis of a horizontal sleeve to a third mirror that is mounted on a sleeve bearing so that it is rotatable about the horizontal axis. In like fashion, the beam from the third mirror is successively incident on fourth, fifth, sixth, seventh, and eighth mirrors all of which are rotatable about the axis of the shaft down which the incident beam propagates. Finally, the beam from the eighth mirror enters the output device. The second through eighth mirrors are all mounted in the articulated arm and are interconnected by sleeve bearings and, in some cases, hollow tubes. The arm is supported by a counterbalancing system that is connected to the arm at a point between the third and fourth mirrors.

22 Claims, 5 Drawing Figures



United States Patent [19] [11] 4,388,924
Weissman et al. [45] Jun. 21, 1983

[54] METHOD FOR LASER DEPILATION

[76] Inventors: Howard R. Weissman, 9216 Middlebelt, Livonia, Mich. 48150; Joseph Mantel, 21819 Constitution, Southfield, both of Mich. 48076

[21] Appl. No.: 265,878

[22] Filed: May 21, 1981

[51] Int. Cl.[3] A61N 5/00
[52] U.S. Cl. 128/303.1; 128/355; 128/398
[58] Field of Search 128/303.1, 395–398, 128/355

[56] References Cited

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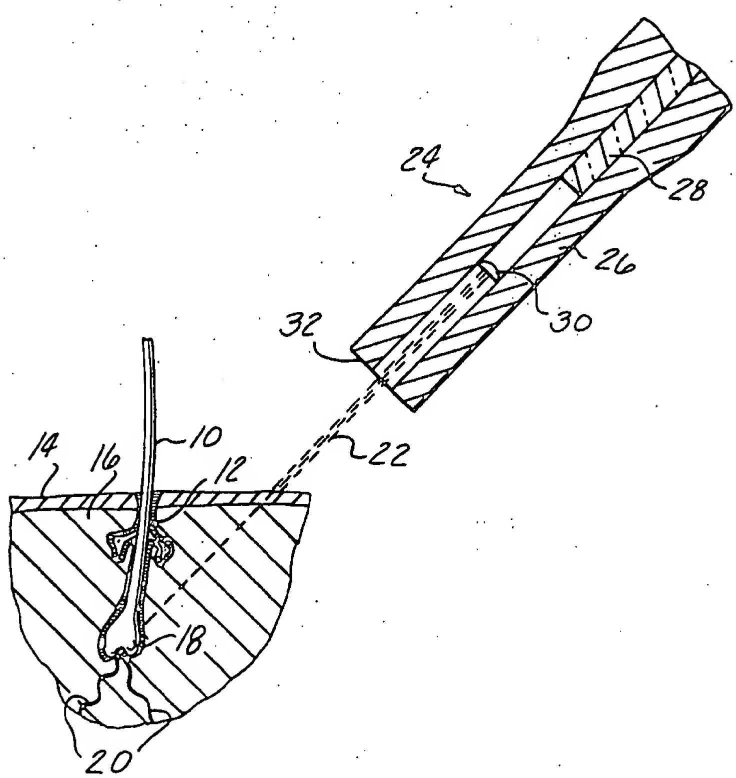
Primary Examiner—Lee S. Cohen
Attorney, Agent, or Firm—Krass, Young & Schivley

[57] ABSTRACT

The roots of human hairs of a patient are devitalized using high intensity, short duration pulses of light having wavelengths with respect to which the skin of the patient is non-absorbative and the hair of the patient is relatively absorbative. A narrow, focused beam of the light is aimed at the epidermis of the patient adjacent the hair such that an extension of the beam intersects the hair root at an angle relative to the skin surface. A short pulse passes through the skin and is absorbed in the hair root, destroying its blood supply. Apparatus for practicing the method employs a manually controlled two-axis positioning system supporting the focusing system that is connected to a laser light source by a flexible fiber optic bundle. A shutter selectively positionable in the optical path allows a low intensity beam to be produced for aiming and the shutter is removed from the optical path for the pulse period to produce the high energy beam.

7 Claims, 4 Drawing Figures



US005182857A

United States Patent [19]

Simon

[11] **Patent Number:** 5,182,857

[45] **Date of Patent:** Feb. 2, 1993

[54] **SHAVING APPARATUS**

[75] Inventor: **Pal Simon**, Warstein, Fed. Rep. of Germany

[73] Assignee: **U.S. Philips Corp.**, New York, N.Y.

[21] Appl. No.: **679,077**

[22] PCT Filed: **Oct. 29, 1990**

[86] PCT No.: **PCT/EP90/01929**

§ 371 Date: **Sep. 3, 1991**

§ 102(e) Date: **Sep. 3, 1991**

[87] PCT Pub. No.: **WO91/06406**

PCT Pub. Date: **May 16, 1991**

[30] **Foreign Application Priority Data**

Nov. 2, 1989 [DE] Fed. Rep. of Germany 3936367

[51] **Int. Cl.**[5] **A61B 17/00**

[52] **U.S. Cl.** **30/34.05**; 30/140; 132/118; 606/9

[58] **Field of Search** 30/140, 32, 34.05; 606/9, 19, 13; 132/118

[56] **References Cited**

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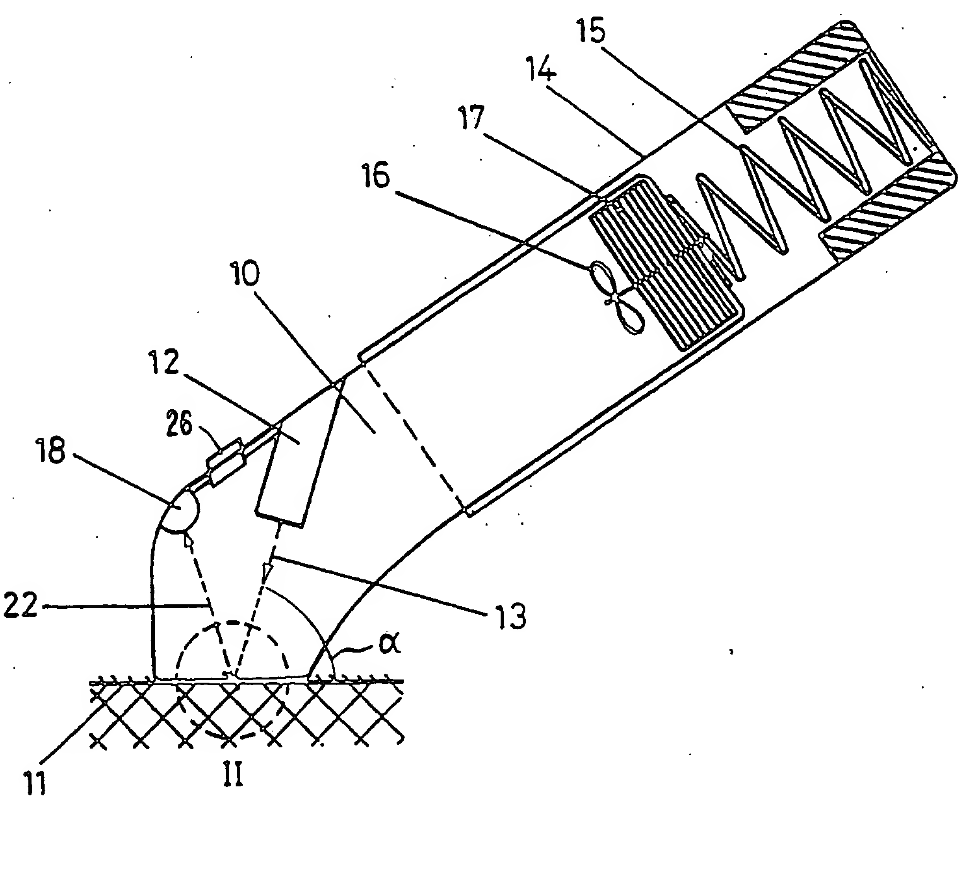
Primary Examiner—Douglas D. Watts
Assistant Examiner—Hwei-Siu Payer
Attorney, Agent, or Firm—Ernestine C. Bartlett

[57] **ABSTRACT**

The invention relates to a shaving apparatus which is characterized in that a laser beam **(13)** serves as the cutting means, and to a method of removing body hairs by means of such a shaving apparatus. The shaving apparatus comprises a shear plate **(11)** with an entry slot **(24)**. The laser beam **(13)** is generated by a device **(12)**, severs the hair in the proximity of the entry slot, and is preferably reflected from the shear plate and detected by a photo-cell **(18)**. The shaving apparatus in accordance with the invention enables body hairs to be severed without irritating the skin.

10 Claims, 3 Drawing Sheets



US006074382A

United States Patent [19]

Asah et al.

[11] **Patent Number: 6,074,382**

[45] **Date of Patent: Jun. 13, 2000**

[54] **APPARATUS FOR TISSUE TREATMENT**

[75] Inventors: **Bjarne Asah**, Taastrup; **Olav Balle-Petersen**, Humlebæk, both of Denmark

[73] Assignee: **Asah Medico A/S**, Hvidovre, Denmark

[21] Appl. No.: **08/974,429**

[22] Filed: **Nov. 19, 1997**

[30] **Foreign Application Priority Data**

Aug. 29, 1997 [DK] Denmark 0989/97

[51] **Int. Cl.**^{7} **A61B 17/36**

[52] **U.S. Cl.** **606/9**; 606/10; 606/11; 606/12

[58] **Field of Search** 606/3, 10, 11, 606/12, 14, 15, 16, 17

[56] **References Cited**

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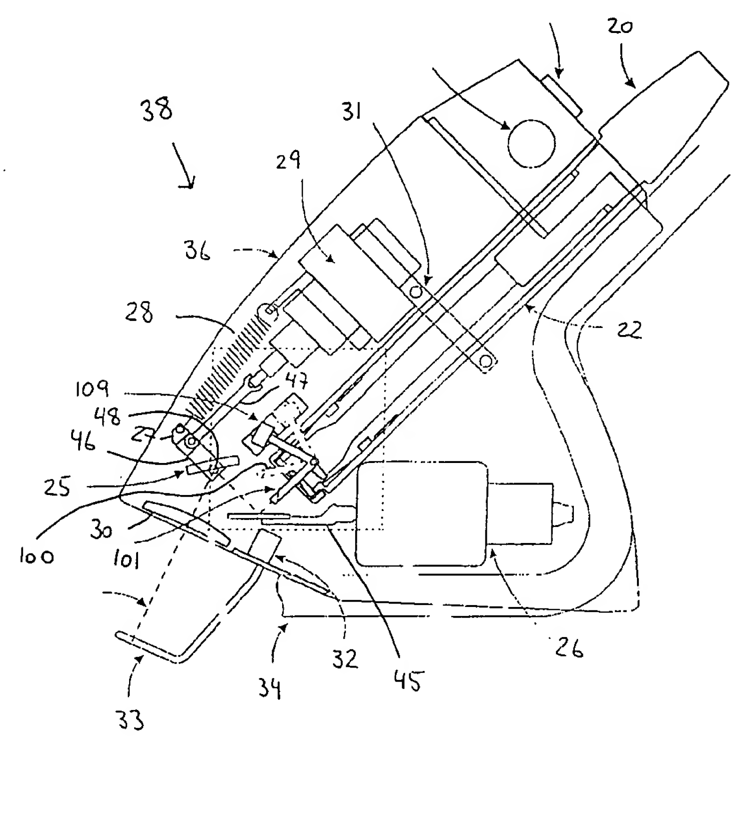
WO9824514	6/1998	WIPO .
WO9825528	6/1998	WIPO .

Primary Examiner—Linda C. M. Dvorak
Assistant Examiner—Sonya Harris-Ogugua
Attorney, Agent, or Firm—Birch, Stewart, Kolasch & Birch, LLP

[57] **ABSTRACT**

An apparatus for tissue treatment is provided, comprising a light emitter for emission of a first light beam, director for directing the first light beam towards a target area to be treated, detector for detecting at least one tissue parameter at the target area, and first light beam controller for controlling at least one parameter without interruption of the propagating light beam. The tissue parameter may be selected from the group of texture, elasticity, size and shape. The apparatus may be used for ablating a thin epidermal layer of the derma of a patient and also marks on the tissue such as marks from chloasma, liver spots, red spots, tattoos, blood vessels just below the surface, etc. as well as warts, wounds, hair follicles, etc. may be ablated or treated.

34 Claims, 9 Drawing Sheets



US005595568A

United States Patent [19]

Anderson et al.

[11] **Patent Number: 5,595,568**

[45] **Date of Patent: Jan. 21, 1997**

[54] **PERMANENT HAIR REMOVAL USING OPTICAL PULSES**

[75] Inventors: **R. Rox Anderson**, Lexington; **Melanie Grossman**, Boston; **William Farinelli**, Danvers, all of Mass.

[73] Assignee: **The General Hospital Corporation**, Boston, Mass.

[21] Appl. No.: **382,122**

[22] Filed: **Feb. 1, 1995**

[51] **Int. Cl.**^{6} **A61N 5/06**

[52] **U.S. Cl.** **606/9**

[58] **Field of Search** 606/9, 10, 11, 606/12, 17, 14, 15, 16

[56] **References Cited**

U.S. PATENT DOCUMENTS

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5,486,172	1/1996	Chess	606/9

FOREIGN PATENT DOCUMENTS

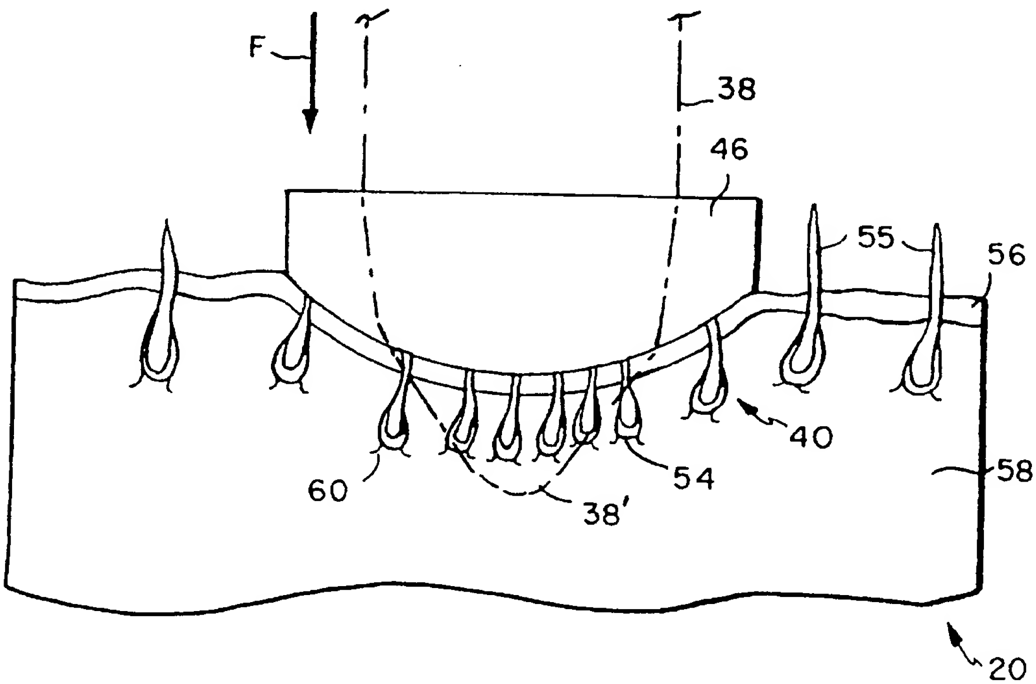
WO86/02783 9/1986 WIPO .

Primary Examiner—Angela D. Sykes
Assistant Examiner—Sonya Harris-Ogugua
Attorney, Agent, or Firm—Wolf, Greenfield & Sacks, P.C.

[57] **ABSTRACT**

A method and apparatus for simultaneously removing multiple hair follicles from a skin region of a patient. The method includes the step of illuminating the hair follicles with a large-area, optical radiation field by way of a transparent contact device proximal to the skin region. This allows portions of the hair follicles to be heated and then removed, while the surrounding skin region is left relatively free of injury.

22 Claims, 7 Drawing Sheets



US006306128B1

(12) United States Patent
Waldman et al.

(10) Patent No.: US 6,306,128 B1
(45) Date of Patent: *Oct. 23, 2001

(54) **COOLING APPARATUS FOR CUTANEOUS TREATMENT EMPLOYING A LASER AND METHOD FOR OPERATING SAME**

(75) Inventors: **Amir Waldman**, Hod Hasharon; **Michael Slatkine**, Herzlia; **Ofer Braude**, Ramat Gan; **Arie Klein**, Kfar Saba; **Yitzhak Rozenberg**, Tel Aviv; **Jerry Talpalariu**, Petach Tikya, all of (IL)

(73) Assignee: **Laser Industries Ltd.**, Tel Aviv (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **09/252,870**

(22) Filed: **Feb. 8, 1999**

Related U.S. Application Data

(62) Division of application No. 08/729,240, filed on Oct. 9, 1996, now Pat. No. 5,868,732.

(51) **Int. Cl.**[7] **A61B 18/18**
(52) **U.S. Cl.** **606/9**; 606/13; 606/16; 607/89
(58) **Field of Search** 606/1, 9, 13, 16; 401/188; 607/88–91

(56) **References Cited**

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5,507,740		4/1996	O'Donnell, Jr. .	
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5,683,380		11/1997	Eckhouse et al. .	
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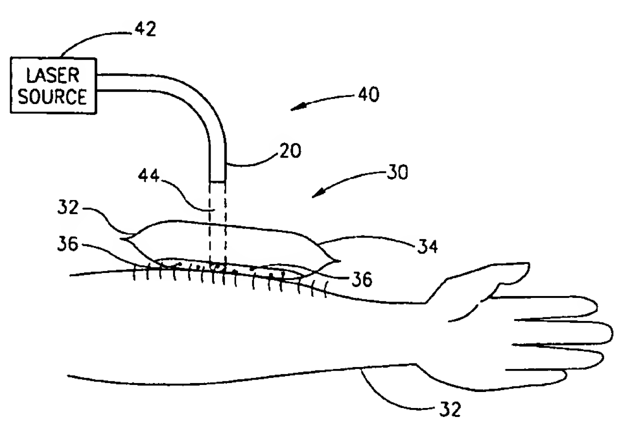
Primary Examiner—Roy Gibson
(74) *Attorney, Agent, or Firm*—Eitan, Pearl, Latzer & Cohen-Zedek

(57) **ABSTRACT**

Apparatus and method for tracking the operation of a light beam, preferably a laser light beam, which operates to treat the skin of the patient. The apparatus includes plurality of markings in accordance with the light beam impinges on the locations to be treated. The apparatus including the plurality of markings may be a cooling apparatus which also cools the skin during the treatment.

24 Claims, 4 Drawing Sheets



US005868732A

United States Patent [19]

Waldman et al.

[11] Patent Number: 5,868,732

[45] Date of Patent: Feb. 9, 1999

[54] COOLING APPARATUS FOR CUTANEOUS TREATMENT EMPLOYING A LASER AND METHOD FOR OPERATING SAME

[75] Inventors: **Amir Waldman**, Hod Hasharon; **Michael Slatkine**, Herzlia; **Ofer Braude**, Ramat Gan; **Arie Klein**, Kfar Saba; **Yitzhak Rozenberg**, Tel Aviv; **Jerry Talpalariu**, Petach Tikya, all of Israel

[73] Assignee: **ESC Medical Systems, Ltd.**, Yokneam, Israel

[21] Appl. No.: **729,240**

[22] Filed: **Oct. 9, 1996**

[30] **Foreign Application Priority Data**

May 12, 1996 [IL] Israel 118229

[51] **Int. Cl.**[6] **A61B 17/36**

[52] **U.S. Cl.** **606/9**

[58] **Field of Search** 606/1, 2, 4, 5, 606/6, 10, 11, 12, 14, 15, 16, 17

[56] **References Cited**

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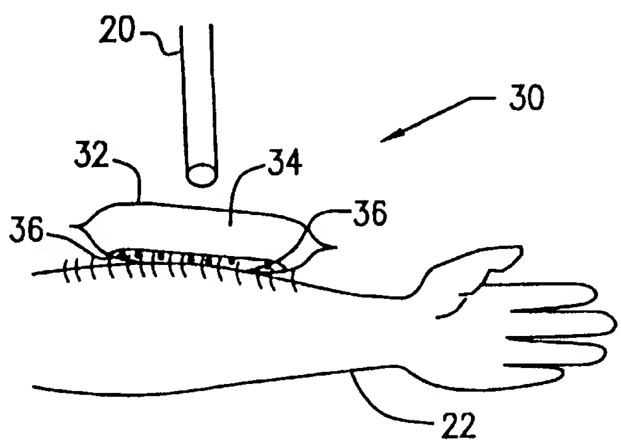
5,505,726	4/1996	Meserol	606/9
5,507,740	4/1996	O'Donnell, Jr.	606/4
5,595,568	1/1997	Anderson et al.	606/9
5,683,380	11/1997	Eckhouse et al.	606/9
5,741,245	4/1998	Cozean et al.	606/5

Primary Examiner—Max Hindenburg
Assistant Examiner—Sonya Harris-Ogugua
Attorney, Agent, or Firm—Richard I. Samuel, Esq.; Friedman Siegelbaum LLP

[57] **ABSTRACT**

Apparatus and method for tracking the operation of a light beam, preferably a laser light beam, which operates to treat the skin of the patient. The apparatus includes plurality of markings in accordance with the light beam impinges on the locations to be treated. The apparatus including the plurality of markings may be a cooling apparatus which also cools the skin during the treatment.

12 Claims, 4 Drawing Sheets



US006090101A

United States Patent [19]

Quon et al.

[11] **Patent Number: 6,090,101**

[45] **Date of Patent: Jul. 18, 2000**

[54] **METHOD AND APPARATUS FOR PERMANENT HAIR REMOVAL**

[76] Inventors: **David K. Quon; Hew W. Quon; Wanda A. Quon**, all of 808 N. Hill St., Los Angeles, Calif. 90012

[21] Appl. No.: **08/987,956**

[22] Filed: **Dec. 10, 1997**

[51] **Int. Cl.**^{7} **A61B 17/36**

[52] **U.S. Cl.** **606/9**

[58] **Field of Search** 606/9, 10, 11, 606/12, 14, 2, 15, 16, 17, 133, 134, 34, 35, 36, 41, 42, 43

[56] **References Cited**

U.S. PATENT DOCUMENTS

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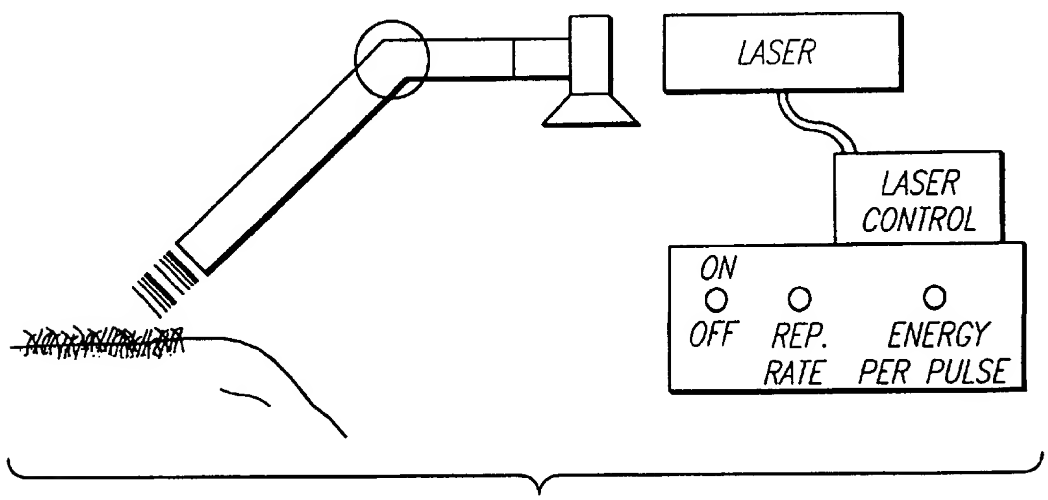
5,669,916	9/1997	Anderson	606/133

Primary Examiner—Linda C.M. Dvorak
Assistant Examiner—Sonya C. Harris
Attorney, Agent, or Firm—Kleinberg & Lerner, LLP; Marvin H. Kleinberg

[57] **ABSTRACT**

A permanent hair removal method includes the steps of preparing the surface of the skin, including the removal of excess hair and the application of suitable cleansers and degreasers. Alkaline ions, in a gel, cream, ointment or solution containing a buffered solution of potassium carbonate and sodium bicarbonate are applied to the clean, prepared surface. Apparatus using massage, ultrasound or other treatment modalities, promotes the penetration of the alkaline ions into the skin and hair follicles. The alkaline ions are then heated in situ through the use of a radiant energy source apparatus such as, for example, a laser, a infra red lamp or other high intensity light source. Radiant energy can also be provided by microwave or diathermy sources. The heated alkaline ions will then destroy all hair cells that are encountered.

27 Claims, 3 Drawing Sheets



US005725522A

United States Patent [19]

Sinofsky

[11] **Patent Number: 5,725,522**

[45] **Date of Patent: *Mar. 10, 1998**

[54] **LASER SUTURING OF BIOLOGICAL MATERIALS**

[75] Inventor: **Edward L. Sinofsky**, Dennis, Mass.

[73] Assignee: **Rare Earth Medical, Inc.**, W. Yarmouth, Mass.

[*] Notice: The term of this patent shall not extend beyond the expiration date of Pat. No. 5,207,670.

[21] Appl. No.: **479,950**

[22] Filed: **Jun. 7, 1995**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 327,583, Oct. 24, 1994, Pat. No. 5,540,677, which is a continuation of Ser. No. 57,000, May 3, 1993, abandoned, which is a continuation-in-part of Ser. No. 804,791, Dec. 9, 1991, Pat. No. 5,207,670, which is a continuation-in-part of Ser. No. 538,977, Jun. 15, 1990, Pat. No. 5,071,417.

[51] **Int. Cl.**^{6} **A61N 5/06**

[52] **U.S. Cl.** **606/8**; 606/229; 606/9; 606/144; 606/148

[58] **Field of Search** 606/2, 3, 8–17, 606/213–216, 219, 220, 144, 147, 148, 150, 228, 229; 607/88, 89; 604/304–306

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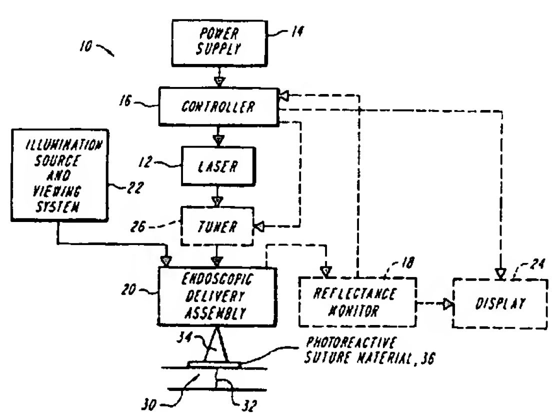
Primary Examiner—Jennifer Bahr
Assistant Examiner—Stephen Huang
Attorney, Agent, or Firm—Thomas J. Engellenner; Lahive & Cockfield, LLP

[57] **ABSTRACT**

Methods and systems for endoscopic suturing of biological tissue are disclosed. Endoscopic instruments are described which serve to position a suture material at an anastomotic site and deliver laser radiation to the suture material to effect fusion. The suture material includes a structure adapted for positioning at an anastomotic site and has at least a portion of the structure formed by a photoreactive crosslinking agent, such that upon irradiation of the structure the crosslinking agent adheres to the biological material. In one embodiment, the suture material can also include a high tensile strength element which is coated with a laser activatable crosslinking agent or glue. Upon activation, the suture material creates a desired closure or joinder of the biological material and is left in place while the endoscope is advanced to another target site or removed.

16 Claims, 4 Drawing Sheets



US005738679A

United States Patent [19]

Daikuzono

[11] Patent Number: 5,738,679

[45] Date of Patent: Apr. 14, 1998

[54] APPARATUS FOR LASER TREATMENT FOR LIVING TISSUE

[75] Inventor: Norio Daikuzono, Cincinnati, Ohio

[73] Assignee: S.L.T. Japan Company Limited, Tokyo, Japan

[21] Appl. No.: 670,361

[22] Filed: Jun. 26, 1996

[51] Int. Cl.^{6} A61B 17/36

[52] U.S. Cl. 606/11; 606/9

[58] Field of Search 606/4, 5, 6, 13, 606/14, 10, 11, 12, 17, 18

[56] References Cited

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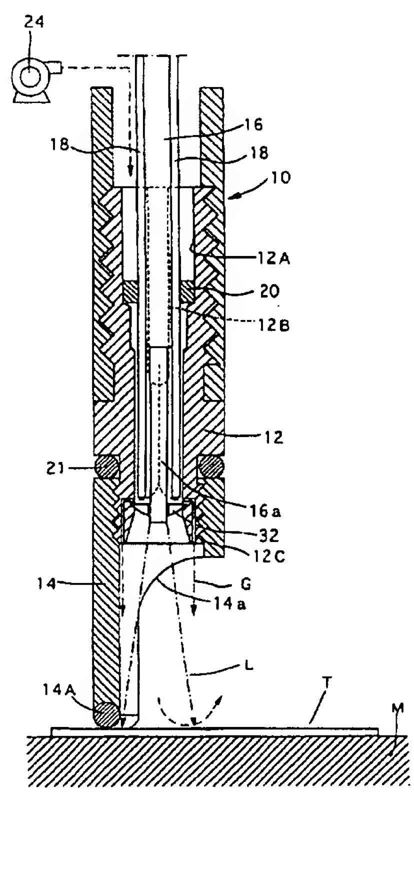
Primary Examiner—Jennifer Bahr
Assistant Examiner—Sonya Harris-Ogugua
Attorney, Agent, or Firm—Andrus, Sceales, Starke & Sawall

[57] ABSTRACT

The present invention is used for irradiating the entire of nevus on the skin with laser light uniformly and efficiently to remove it.

A laser treating apparatus for living tissue the present invention comprises a laser light generator; a main optical fiber for receiving the laser light from said laser light generator to irradiate the surface of the living tissue with the laser light; a plurality of optical fiber bundle which is annularly disposed around the main optical fiber and having the front ends facing the surface of the tissue; laser light switching means between said laser light generator and said laser light transmitting means; a first light quantity detecting means for measuring the quantity light which has been emitted from said laser light transmitting means and has been reflected on the surface of the tissue; second light quantity of detecting means for measuring the quantity of laser light reflected on a predetermined area on said surface of the tissue; and irradiation control means for impinging the laser light from said laser light generator upon said laser light transmitting means by actuating said switching means when the irradiation of laser light is determined necessary based upon the ratio (Im/Ir) of the second light quantity Im measured by said second light quantity detecting means to the first light quantity Ir measured by said first light quantity detecting means which is used as an index representing whether or not unirradiated area is present, reirradiation is necessary.

10 Claims, 9 Drawing Sheets



US005820625A

United States Patent [19]

Izawa et al.

[11] **Patent Number: 5,820,625**

[45] **Date of Patent: Oct. 13, 1998**

[54] **LIGHT DEPILATING APPARATUS**

[75] Inventors: **Yoshihiro Izawa; Iwao Yamazaki**, both of Tokyo, Japan

[73] Assignee: **Ya-man Ltd.**, Tokyo, Japan

[21] Appl. No.: **755,569**

[22] Filed: **Nov. 27, 1996**

[30] **Foreign Application Priority Data**

Sep. 26, 1996 [JP] Japan .... 8-009690 U

[51] **Int. Cl.**^{6} **A61B 17/36**

[52] **U.S. Cl.** **606/9**; 606/13; 607/88

[58] **Field of Search** 606/3, 9–13; 607/88–89

[56] **References Cited**

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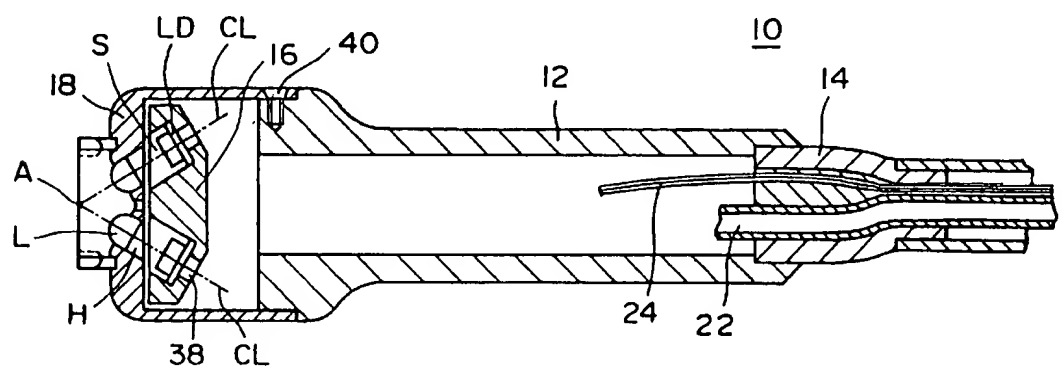
Assistant Examiner—Roy Gibson
Attorney, Agent, or Firm—Kane, Dalsimer, Sullivan, Kurucz, Levy, Eisele and Richard, LLP

[57] **ABSTRACT**

A light depilating apparatus comprising a light depilating probe, an electric controller, and a connection cable for connecting the light depilating probe to the electric controller whereby the light depilating probe is brought into contact with a portion of skin to be depilated; wherein the light depilating probe includes: a hollow body; a head cap having opened and closed ends and being attached at its opened end to one end portion of the body so as to form an inner space in the head cap; a transparent contacting cylinder provided on a head of the head cap at its closed end so that the cylinder is brought into contact with skin; a holding block provided in the inner space of the head cap; a connection cap provided at the other end portion of the body to hold a terminal of the cable connected to the electric controller; a plurality of light-emitting sources constituted by semiconductor laser elements mounted in holes formed in the holding bock so as to be excited by the electric controller through electric conductors; holes provided in the closed end of the head cap so that light paths are formed though the holes of the holding block and the holes in the head cap respectively so as to make all the light beams emitted from the light-emitting sources are focused to one focal point within an outside end surface of the contacting cylinder which is brought into contact with skin.

9 Claims, 2 Drawing Sheets



US005860967A

United States Patent [19]

Zavislan et al.

[11] **Patent Number: 5,860,967**

[45] **Date of Patent: Jan. 19, 1999**

[54] **DERMATOLOGICAL LASER TREATMENT SYSTEM WITH ELECTRONIC VISUALIZATION OF THE AREA BEING TREATED**

[75] Inventors: **James M. Zavislan; Jay M. Eastman,** both of Pittsford, N.Y.

[73] Assignee: **Lucid, Inc.,** Henrietta, N.Y.

[21] Appl. No.: **94,296**

[22] Filed: **Jul. 21, 1993**

[51] **Int. Cl.**^{6} **A61N 5/02**

[52] **U.S. Cl.** **606/9**; 606/10; 606/12; 607/89

[58] **Field of Search** 606/9–13, 16–18; 607/89

[56] **References Cited**

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Primary Examiner—Michael Peffley
Attorney, Agent, or Firm—M. Lukacher; K. Lukacher

[57] **ABSTRACT**

A hand held microsurgical instrument for applying laser energy to selected locations (sites) in an area under the skin (or other exposed translucent tissue) to provide localized photothermolysis of underlying tissue at these sites, is described. The laser energy is focused into a spot within the tissue. This spot is of sufficiently small size so that the energy density is sufficient to provide surgical or treatment effects within the tissue without damaging the surface tissue. In dermatology, for example, the technique can be used to destroy endothelial cells in blood vessels which are desired to be removed, such spider veins (nevi) in the skin, hair follicles to prevent hair growth therefrom, or other microsurgical procedures. The area is visualized while the laser beam is steered, using a deflection system, in X and Y coordinates. A telecentric optical system, in which a mirror of the deflection system is located, directs the laser light essentially perpendicular to the area to be treated as the beam is scanned over the area. The optical system also focuses illumination light reflected from the area to a sensor matrix of a CCD video camera. The reflected illumination light is imaged essentially parallel to the optical axis in the object space thereby providing a precise, high resolution image corresponding to the area. The laser beam may be tracked as it is deflected over the area to the selected locations by visualization thereof on a display or monitor associated with the video camera. The locations are then apparent to the treating physician who can then effect an increase of the beam power or turn the beam on so as to treat the tissue in the selected locations.

30 Claims, 9 Drawing Sheets